RESPONSE
EQUILON PIPELINE COMPANY LLC on behalf of OLYMPIC PIPE LINE COMPANY
CORRECTIVE ACTION ORDER
CPF NO. 59505-h

With respect to the Ferndale, Washington to Allen, Washington segment:

1. Do not operate this segment until completing items 2 through 4, and obtaining written approval of the Regional Director, Western Region of the plan provided for in Item 5.

RESPONSE:

Segment is currently not operating. Progress on items 2 through 4, and written plan mandated in Item 5 is detailed within this response.

2. Review of the Supervisory Control and Data Acquisition System (SCADA) to determine the cause of deficiencies that occurred on June 10, 1999 and correct these deficiencies.

RESPONSE:

A. Cause of computer slowdown:

The computer slow down on the Olympic Control Center SCADA system was the result of multiple factors:

1. The CPU resources of the computers utilized were running at 75%~8Oo½o of capacitv:

2. Apparently, an error occurred in one or more of the historical database records, causing processes that reference these database records to require error handling, and:

3. There was a significant increase of RTU data processing required as the pipeline events began unfolding in the field.

While the computer resources available on this system were adequate for normal and most exceptional operations, the reserve resources were limited. The available reserve CPU resource was insufficient to meet the demands of all normal processing, in addition to the demands of the software '5 error handling routines, plus the additional load of processing field data monitoring a pipeline that was in an upset condition, and changing rapidly. During this time, the error logs show that the RTU scans, discrete processing, analog processing and requests from Controller displays were demanding more CPU resource than was available. When the situation was identified, the computer was not

able to respond to shutdown commands and was stopped. The backup system began running well, but quickly developed the exact same problem. The problem cleared when the original prime computer was re-booted and a preemptive removal of all recent database modifications was accomplished. This computer was then brought up as the prime computer from a "cold" condition. After communication was established, the computer began running all applications in an appropriate manner. A comprehensive report regarding the computer system will be provided shortly.

B. Corrective Action:

Multifaceted Corrective Action has been undertaken to address those issues identified in section A. above:

1.As an interim measure, the interface for a data transfer application utilized to feed data to an offline pipeline modeling tool was moved from the prime to the backup computer. This action released approximately 25% of the CPU resource from the prime computer.

2. *A hardware and VMS operating system evaluation was commissioned. The results showed the system to be setup properly, but did offer a few recommendations to recover CPU resources. These enhancements were installed and resulted in an additional 5% recovery of CPU resources.*

3. *An extensive software review was undertaken and the Olympic software was installed on a set of test machines and subjected to severe stress testing. However, the results of this test were inconclusive because a similar failure could not be reproduced. The probable reason the situation could not be reproduced is twofold. First, the computers utilized as the test machines have processors that are 600% faster than the ones in service on the Olympic pipeline. Second, the software passed all tests and appears to be properly programmed, setup and run. It is felt that the additional CPU power on the test configuration allowed the computer systems to survive these stress tests, leading to the inconclusive comparison to the existing system.*

4. *Hardware was purchased to upgrade the computers at the Olympic Control Center. This upgrade increases CPU resource by 750% and is comparable with SCADA systems maintaining much larger systems. Installation of the first hardware for this upgrade was completed on July 20, 1999. [Please see the response to item 5(b) for a description of additional planned computer hardware upgrades]*

The existing computers, with the recovery of approximately 30% of CPU resources, should be well within the range of maintainability for a system of Olympic's size. With the additional resources provided by the computer upgrade, the possibility of CPU overloading should be effectively eliminated.

3. Test mainline valves intended to isolate sections of the pipeline transversing populated and environmentally sensitive areas. Take any needed remedial action to assure they will perform their intended function.

RESPONSE:

All Motor Operated Mainline Block Valves between Ferndale and Allen will be tested for operation and verification of holding a differential pressure during the purging of the pipeline before startup. (SEE ALLEN STATION TO RENTON STATION 16" PIPELINE SYSTEM MOTOR OPERATED BLOCK VALVE TEST, JULY 2, 1999 ENCLOSED AS "ATTACHMENT 1')

4. Install a check valve adjacent to the Lakeway Drive block valve at milepost 16.22.

RESPONSE:

A construction and pigging project was commenced on the 16" Ferndale to Bayview line. Construction includes installing approximately 280ft of 16", .500', wall, X-52 pipe at the release site and a check valve adjacent to the MP 16.22 block valve. Further, there will be a check valve installed at MP 22, and a hand wheel operated mainline block valve at MP 12, that will later be converted to a remotely operated valve.

5. Develop a plan with corrective measures that address factors playing a role in the release. The plan must include the following items to the extent that they address factors in the release:

(NOTE: ITEM 10 WITHIN THE ORDER STATES THAT THE PLAN CONTEMPLATED UNDER THIS SECTION SHOULD ALSO INCLUDE CONSIDERATION OF THE 16" ALLEN, WASHINGTON TO RENTON, WASHINGTON SEGMENT. THEREFORE, ANY CORRECTIVE ACTION UNDER THIS PLAN THAT WILL BE APPLIED TO THE ENTIRE 16" LINE, BOTH SEGMENTS OF LINE, OR ANY PARTS OF SAME, WILL BE SO STATED WITHIN THIS RESPONSE. IN ADDITION, OLYMPIC IS CONTEMPLATING TAKING CERTAIN ACTIONS AS THEY REGARD ITS ENTIRE SYSTEM, AS PROVIDED HEREIN.)

a. A review of the existing mainline block valves and check valves taking into consideration elevation, population, and environmentally sensitive locations, and plan for additional mainline block valves and check valves to minimize the consequences of a release from the pipeline. The block valves will have remote operation capability as deemed appropriate by the review.

RESPONSE:

MARMAC Engineering and Design has been retained and is presently reviewing mainline block valves and check valve spacing and effectiveness relative to elevation, population and environmentally sensitive areas. This review was initiated on June 30, 1999, and the Ferndale to Allen segment is scheduled to be complete by August 1, 1999. This review will ultimately be undertaken for the entire system.

b. A comprehensive review of the Supervisory Control and Data Acquisition System (SCADA) to detect any deficiencies, with a schedule for modifications.

RESPONSE:

As was set out in Section 2 of this response, an extensive set of hardware evaluations, operating system tuning, software review/tuning and stress testing has been undertaken to determine the cause of the deficiencies. A series of recommendations has been compiled and is in the process of being implemented:

1. *The data transfer application that serves the PLDS modeling system was moved to the backup computer on June 24, 1999;*

2. *As a result of the operating system evaluation and tuning, a group of parameters utilized by the system and the application was modified on June 27, 1999.*

3. *Hardware upgrades have been delivered to increase CPU resources 750%. The first computer upgrade is completed, with the second upgrade planned for July 26, 1999; and*

4. *After the extensive software review and stress testing, there are a series of recommendations for the Vector application queues. These recommended modifications are currently being installed.*

A final report in this area is scheduled to be completed by August 6, 1999. Obviously, these computer system modifications will be implemented for the entire pipeline system.

c. Cathodic protection surveys with scheduled remedial action.

RESPONSE:

Based upon further investigation, Olympic Pipe Line Company would respectfully request that no action be determined to be necessary in this area under this order, as this aspect of pipeline operation does not appear to have been one of the "factors playing a role in the release".

Our review of the cathodic protection records for the prior two surveys suggest corrosion was not a factor in the release. Further, on June 12 1999, a close interval survey in the area of the release and the City of Bellingham water treatment facility was done under the supervision of the Department of Transportation, and the results were satisfactory. Finally, when the pipeline was exposed by excavation, no evidence of corrosion was found. Third party damage in the area of the pipeline rupture would appear to correlate better as a potential contributing factor than corrosion of any kind.

d. Pressure Testing.

RESPONSE:

Based upon further inspection, Olympic Pipe Line Company would respectfully request that a hydrostatic proof test of the section between MP 12 to MP 22 within the City of Bellingham, along with the use of two internal inspection tools, be considered as satisfying this area.

Hydrostatic proof testing is a widely used and accepted method to determine the structural integrity (pressure containing capacity) of pipelines, pressure vessels, and storage tanks. Structural integrity is proven by raising the pressure level to the structure or container to a level above the maximum operating pressure. The proof test reveals any harmful manufacturing, fabrication, or time dependent (such as wall loss due to corrosion or mechanical damage existing at the time of the test) defects that could cause service failures. The minimum proof test pressure for liquid pipelines is defined by 49 CFR Part 195 as 125% of the maximum operating pressure.

The best evidence of the value of proof testing is the large numbers of miles of pipelines that have given years of trouble free service after having been hydrostatically proof tested to pressures above their maximum operating pressures. However, proof testing cannot prevent all service failures. Obviously, defects that continue to grow during service or defects not existent at the time of testing are not subject to failure during proof testing. Also, there are recorded incidents in which a defect survived a proof test and failed at a lower pressure level. Hypothetically, defect growth is time dependent and the proof test ends before the defect grows to critical size for failure. Reduced failure pressure results because of the increased defect length. But such a pressure reduction does not result in an unsafe pipeline if the difference between the proof test pressure and the operating pressure is large enough to assure the increased defect length is not critical. These "pressure reversals" are usually small. Failure level due to pressure reversal is only 1 to 10 percent below the proof test level. However, there are recorded rare incidents of larger pressure reversals.

The ASME B31G criteria for evaluating wall loss was developed based upon the principle that it "should leave the pipeline in such a condition that it is at least as safe as if it had been subjected to a hydrostatic proof test ". The B31G criteria have been used successfully for evaluating corroded pipe for removal or repair or leaving it in service. Further, 49 CFR Part 195 recognizes using B31G to evaluate pipe strength based on remaining wall thickness. Conservatism of these criteria is well known. A large portion

of this conservatism comes from using 100% SMYS for the predicted stress level (safety factor of 1.39 vs. 1.25 for hydrostatic testing). Another factor contributing to the conservatism of the B31.4 criteria is corrosion pits are blunt flaws but the criteria is based upon burst tests using relatively sharp flaws.

A pipeline with corrosion pits exceeding the B3JG criteria can survive a hydrostatic proof test. This fact is not surprising considering the conservatism built into the B31G criteria and the fact that most corrosion pits are surrounded by complete, or nearly complete, wall thickness. The surrounding complete wall thickness structurally reinforces the corrosion pits.

Any pipeline successfully proof tested must be protected to prevent any structural deterioration. This protection includes assuring cathodic protection to prevent corrosion damage.

A hydrostatically proof tested pipeline is safe to operate at 80% or less of the test pressure. The pipeline must be protected against time dependent change. Any rehabilitation of a hydrotested pipeline should be based upon cathodic protection surveys, smart pig surveys, leak history, pipeline damage history, and safety/environmental impact.

The Olympic 16" pipeline from the Ferndale Station to the Allen Station was hydrostatically proof tested on February 26, 1965 when construction was completed to 1713 psi at Lake Samish. The pipeline section around the City of Bellingham's water treatment facility was hydrostatically tested when construction was completed on June 20, 1966 to 1820 psi. These hydrostatic proof tests demonstrated the pipeline's structural integrity.

The June 10, 1999 failure appears at this time to have occurred in part due to mechanical third party damage. This damage includes gouges and dents. The best method available to locate and size dents is a deformation type internal inspection tool. The best deformation tools available locate, dimension and orient (i.e. 0 'clock position) dents. A hydrostatic proof test would most likely not cause a plain dent (one without a stress riser such as a deep scratch, a groove, or a gouge) to fail. In fact, a hydrostatic proof test could cause rerounding of the dent affected area. This rerounding could contribute to fatigue failure of the dent at some future time, although a one-time event, it would be at a hoop stress much higher than the normal operating hoop stress. This is particularly true if the dent includes a stress riser.

Gouges may or may not fail during a hydrostatic proof test. As with any wall loss type flaw, failure would depend on its depth, length, orientation and location. A hydrostatic proof test would eliminate gouges with critical dimensions for the test pressure. The proof test could result in pressure reversal failure at a later date, if the gouge grew to critical size for a lower pressure but did not fail during hydrostatic proof testing (i.e. the gouge area could fail). A high resolution internal inspection tool can find gouges if their dimensions and orientation are within the tool's capabilities. Any gouges indent fied by

the internal inspection tool would require excavating the pipeline and visually examining and evaluating the damage as detailed below.

Therefore, based on what has been learned to this point regarding the June 10, 1999 failure, we recommend inspecting the Olympic 16', pipeline using both a high-resolution magnetic flux leakage internal inspection tool and a deformation tool. We do not recommend hydrostatic proof testing of the entire pipeline based upon its operating history and original construction hydrostatic proof testing. However, we have agreed to hydrostatically proof test the section of line between MR 12 and MR 22 at the request of the City of Bellingham. This test area does include the area to be repaired as a result of the June 10th release.

e. Internal inspection tool surveys and remedial action to assure the integrity of the pipeline. The type of internal inspection tool used shall be the best available technology appropriate for assessing the system based upon the type of failure that occurred on June 10, 1999.

RESPONSE:

As was referenced in the previous response, Olympic will internally inspect the approximately 121 miles from Cherry Point to Renton using Tuboscope,5 high-resolution magnetic flux leakage tool and their deformation tool. These tools are considered the best available internal inspection technologies that will enable Olympic to evaluate the 16" pipeline for potential mechanical damage and wall loss flaws.

The tool will be run within 2 weeks after startup of the Ferndale to Bayview segment. The results of the internal inspection will be acted upon as follows:

1.Results will be compared with the 1996 Tuboscope (low-resolution) wall loss tool results and the 1997 Enduro caliper tool results. The Olympic pipe inspection data that resulted from their excavations reacting to these two inspection tool's findings will be used to better calibrate the high resolution and deformation tools results;

2. Any pipe defects or anomalies identified will be repaired consistent with DOT regulations and the engineering standards incorporated therein.

Results will also be used to evaluate the replaced pipeline section for construction damage. It is Olympic's intent to ultimately perform internal inspections of its entire main line system.

6. Submit the written plan to the Director, Western Region, Office of Pipeline Safety, Research and Special Programs Administration, 555 Zang Street, 2nd Floor, Lakewood, Colorado 80228.

RESPONSE:

The responses referenced in Items S (a) through (e) above constitute the written plan submission, and were sent to the Director at what we understand to be the new address of 12600 West Colfax Avenue, Suite A-250, Lakewood, Colorado 80215-3736.

7. Restrict the MOP of the Ferndale, Washington to Allen, Washington to 1056 psig, which is 80% of the normal operating pressure. Equilon may request approval from the Associate Administrator, OPS to increase its pressure based on a showing that the hazard has been abated. OPS' approval must be in writing.

RESPONSE:

The maximum settings of the Ferridale pump station have been reduced to 80% of the normal operation setting.

Discharge control (control valve maximum setpoint).	*1320 to 1050 psi*
Discharge Shutdown (Discharge Switch)	*1400 to 1100 psi*
Case Shutdown (Control Switch)	*1500 to 1200 psi*

Olympic Pipe Line will respectfully request approval from the Office of pipeline Safety to resume maximum allowable operating pressures based upon a showing that the hazard has been abated. (SEE OVERPRESSURE DERIVATION DOCUMENTATION REVIEW 7/15/99, ENCLOSED AS "ATTACHMENT 2').

8. Implement the plan in Item 5 and coordinate all corrective actions with the Regional Director, Western Region, OPS to assure the integrity of the pipeline.

RESPONSE:

Implementation of an approved plan in Item 5, and the coordination of all corrective actions, will be undertaken by Olympic in close communication with the Regional Director and his representatives.

With respect to the 16" Allen, Washington to Renton, Washington segment:

9. Restrict MOP of this segment to 80% of its normal operating pressure. Equilon may request approval from the Associate Administrator, OPS to increase its pressure based on a showing that the hazard has been abated. OPS' approval must be in writing.

RESPONSE:

The maximum settings of the 16" Allen pump station have been reduced to 80% of the normal operating setting:

Discharge control (control valve maximum setpoint).	*1440 to 1150 psi*
Discharge Shutdown (Discharge Switch)	*1550 to 1200 psi*
Case Shutdown (Control Switch)	*1600 to 1250 psi*

The maximum settings of the 16" Woodinville pump station have been reduced to 80% of the normal operation setting:

Discharge control (control valve maximum setpoint)	*1320 to lO5Opsi*
Discharge Shutdown (Discharge Switch)	*1400 to 11OOpsi*
Case Shutdown (Control Switch)	*1500 to 1200 psi*

Olympic Pipe Line Company will respectfullv request approval from the Office of Pipeline Safety to resume maximum allowable operating pressures based on a showing that the hazard has been abated.

10. Include consideration of this segment within the plan developed within Item 5.

RESPONSE:

Details regarding the implementation of the plan contemplated under item S as they may apply to the Allen to Renton segment of line are detailed within the responses to items 5 (a) through (e) above.

11. The Regional Director may grant an extension of time upon receipt of a written request stating the reasons therefor, for completion of any of the items required under an approved plan.

RESPONSE:

While Olympic does not at this time contemplate having to ask for an extension of time to conduct any of the activities under the plan, as proposed, it will request such an extension if one becomes necessary.

Additional activities to be undertaken by Olympic Pipe Line Company not expressly required by a Corrective Action Order at this time.

1. Perform inline flow test on existing ANSI 300 & 600 surge relief valves in service.

DETAILS:

A plan has been developed to full flow test Bayview and Renton surge relief valves. The Bayview surge relief valves will be full flow tested before startup. Olympic will ultimately full flow test all surge relief valves in its system.

2. Hydraulic Surge Analysis.

DETAILS:

Surge analysis results were prepared by Stoner Associates for the 16" line from Cherry Point to the suction of Allen pump station for the following cases (SEE REPORT OF STONER ASSOCIATES "ATTACHMENT 3").

Case 1.

Case 2.
Closure of inlet valve at Bayview in 4 seconds with a normal flow rate of 9021 bbl/hr
Closure of inlet valve at Bayview Terminal in 4 seconds with a maximum flow rate of9272 bbl/hr without DRA injection at Ferndale.

Case 3.
Closure of Ferndale inlet valve in 4 seconds with a normal flow rate of 9021 bbl/hr.

Case 4.
Closure of inlet valve at Allen Pump Station in 4 seconds with a normal flow rate of 9021 bbl/hr.

The Maximum Allowable Surge Pressure (1.1 x Maximum Allowable Operating Pressure) was not exceeded in any of the four cases; however, these runs are being reevaluated. Attachment 4 is the real time calibration data used for the Stoner Associates normal operation.

The case with the same events as the June 10, 1999 release is still being develope4, and will be provided DOT immediately upon completion.

Olympic will ultimately perform a surge analysis of its entire system.

3. Review design and operation of Bayview Station.

DETAILS:

MARMAC Engineering and Design was retained on June 30, 1999 to perform a complete analysis of Bayview station design.

In reviewing the facility the following modifications will be or have been performed:

1. *The stops on incoming control valves CV-1916 (Anacortes) and CV-1904 (Ferndale) have been removed. (SEE P&ID D-1902-1 "ATTACHMENT 5").*

2. *The downstream pressure control sensor on control valve CV-1916 has been moved from PT-1946 on P&ID D-1903-1 to PT 1929 on P&ID D-1902-1 for more stable control valve pressure sensing. On control valve CV-1904 the downstream pressure control sensor has been moved from PT-195 on P&ID D-1903-1 to PT-1911 on P&ID D-1902-1 for more stable control valve pressure sensing. Attachment 5 highlights the items involved.*

3. *The incoming piping for surge relief RV-1919 (Ferndale) and RV-1923 (Anacortes) will be changed from the bottom of the 16" to the top of the 16".*

4. *Investigate relocating flow switch for surge indication so when the sump is run the surge flow switch is not activated.*

4. Olympic Pipe Line Company Overpressure Derivation Documentation Review.

DETAILS:

An Overpressure Derivation Documentation Review of station discharge control and case shutdown for maximum allowable operating pressure has been completed for the pipeline segments from Cherry Point to Renton (SEE "ATTACHMENT 2'). The complete Olympic pipeline system will ultimately be reviewed during this year.

5. Training.

DETAILS:

Olympic provides a training program for its Operations Controllers, all of whom have over 10 years of experience as controllers at Olympic or other major pipeline companies. Olympic's initial training program includes several months of on the job training from senior operations controllers. During this training period, the trainee is expected to become familiar with all training materials and operational guidelines for normal operation, abnormal operation and emergency procedures. The general contents of the training program manual is as follows:

Function of the Oil Movement Controller
Government Regulations
Matter and Energy
Oil Movements
Supervisor Control Systems
Emergency Procedures
Dispatching
Pump and Prime Movers
Measurement
Station Equipment
Pneumatic; Hydraulic and Electrical Controls
Station and Line Operations

Olympic continues to evaluate its training materials and the training it provides to its Operations Controllers.